Clinical efficacy of anesthesia with intensive care nursing in attenuating postoperative complications in patients with breast cancer

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Abstract

Objective: Complications frequently occur in patients with breast cancer after surgery. Anesthesia nursing plays an important role in decreasing complications for such patients. Thus, this study investigated the effects of anesthesia with intensive care nursing (AICN) on complication rates in patients with breast cancer after surgery.

Methods: Eighty-two patients with breast cancer were recruited in this study. Complications were compared between the anesthesia with usual nursing care (AUCN) and AICN groups.

Results: The results demonstrated that AICN decreased the rates of incision infection, drug extravasation, and catheter exposure, as well as pain and inflammation scores, compared with the findings in the AUCN group. AICN improved the time to orientation and decreased the incidence of nausea, anxiety, depression, and vomiting versus AUCN. In addition, AICN shortened the time to awakening after anesthesia compared with the effects of AUCN. Furthermore, AICN shortened hospital stay and increased survival rates. Notably, AICN improved health-related quality of life as measured using the EORTC QLQ-C30 questionnaire.

Conclusion: AICN provided more benefits and better postoperative outcomes than AUCN, suggesting its utility for minimizing complications in patients with breast cancer after surgery.

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Introduction

Breast cancer is the most prevalent malignancy in women globally, and subsequent treatment is often associated with a considerable psychological burden and reduced quality of life.[1] Breast cancer remains one of the most common cancers among women in China, and surgery is the most popular treatment option for these patients.[2–4] Patients with breast cancer experience significant emotional distress, emotional changes, anxiety, and depression following diagnosis.[5] Negative emotions before surgery can lead to depression, anxiety, and fear for patients with breast cancer.[6] In addition, most patients with breast cancer experience postoperative pain, inflammation, and complications, which lead to nausea, anxiety, depression, and vomiting.[7] These reports indicate that accurate and comprehensive preoperative and postoperative intensive nursing is lacking in patients with breast cancer. Therefore, more efforts are needed to provide intensive nursing for patients with breast cancer before and after surgery.

Anesthesia with intensive care nursing (AICN) is a specialized form of nursing in the recovery/postoperative setting.[8] Clinically, AICN is crucial for clinically treated patients, helping to alleviate anxiety and depression.[9] The effectiveness of specialized nursing could decrease anxiety and stress among patients with breast cancer and other gynecologic cancers.[10] Previous findings indicated that hospitals should employ specialist nurses, and special attention should be paid to the care of clinically treated patients.[11] Specialized nursing contributed to the recovery of low self-esteem in a post-mastectomy patient with schizophrenia.[12] A complex nursing intervention consisting of complementary and alternative medicine increased quality of life in patients with breast and gynecologic cancers undergoing chemotherapy.[13] However, the efficacy of AICN has not fully clarified in postoperative patients with breast cancer.

The aim of this study was to evaluate dysphoria and complications associated with postoperative risks in patients with breast cancer. This study evaluated the effects of community-based AICN on health-related quality of life; risks of incision infection, drug extravasation, and catheter exposure; and pain and inflammation scores in patients with breast cancer after surgery. This study also aimed to propose nursing strategies for decreasing complications among patients with breast cancer after surgery.

Materials and methods

Participants

Patients who underwent mastectomy for breast cancer at Mudanjiang Affiliated Hongqi Hospital of Medicine University from May 2014 to June 2017 were recruited. The inclusion criteria were as follows: female gender, ≥ 28 years old, and body mass index ≤ 32 kg/m^2. The exclusion criteria were a history of cancer or breast surgeries and pregnancy. All enrolled participants underwent preoperative needle biopsy to confirm the diagnosis and computed tomography. All patients provided written informed consent. All patients received preoperative care (preoperative visit, medical observation, and anesthetic

instruction) before surgery.[14] This study was approved by the ethics committee of Mudanjiang Affiliated Hongqi Hospital of Medicine University (clinical trial registration number: CHMDJAHMU20140511X).

Interventions (surgical procedures, AICN, and anesthesia with usual care nursing [AUCN])

Patients with breast cancer underwent surgery with or without an axillary procedure. All procedures were performed as described previously.[15–17] In brief, patients intravenously received 1000 mg of cefazoline (Kefzol, Eurocept, Ankeveen, Netherlands) 30 minutes prior to surgery. In the operating room, hemodynamic and bispectral index monitoring were applied. General anesthesia was induced with 2.0 mg/kg propofol. All surgical procedures were performed by a breast surgeon. Continuous absorbable braided 3/0 sutures and dermal 4/0 sutures were used to close the subcuticular layer (Vicryl, Ethicon, Johnson & Johnson, New Brunswick, NJ, USA) and dermis (Monocryl, Ethicon), respectively. Surgical wounds were dressed with Cutiplast sterile adhesive dressings (Smith & Nephew, Watford, UK). All patients received a single dose of intravenous antibiotics as recommended.[18] All patients were assigned to receive AUCN or AICN. The following variables were monitored in the AUCN group: temperature, wound infection, time to orientation, incision infection, drug extravasation, catheter exposure, nausea, dysphoria, anxiety, depression, vomiting, and hospital stay. In addition to all items monitored in the AUCN group, AICN included the following components: talking with patients, aimlessly walking, night nursing provided by a special care nurse, professional physical massage, sensorial language, and paraverbal and rewording techniques to promote comfort/well-being according to the patients' choice of a safe place or leisure activity. Complications were recorded for all patients.

Outcomes

The primary outcomes of complications in postoperative patients with breast cancer were evaluated in this study. The pain score was measured on day 5 after surgery as described previously.[19] The inflammation score was measured as described previously.[20] Survival was compared between the AUCN and AICN groups after 2 years of follow-up. Patient satisfaction was recorded using a 10-point numerical rating scale (0, complete dissatisfaction; 10, complete satisfaction). Patient quality of life was analyzed using EORTC QLQ-C30.[21] Briefly, EORTC QLQ-C30 includes five functional scales (physical, role, cognitive, emotional, and social functioning) three symptom scales (pain, fatigue and nausea/vomiting), six single items (e.g., constipation, diarrhea, insomnia), and a global health status scale. Scores for each scale range from 0 to 100. Survival was recorded as the disease-free survival rate after 36 months.

Statistical analysis

Data are expressed as the mean ± SD. Data were analyzed using SPSS 16.0 software (SPSS, Chicago, IL, USA). Significant differences were analyzed using the Mann–Whitney two-tailed test. $P < 0.05$ denoted statistical significance.

Results

Eighty-two patients with breast cancer were randomly assigned to receive AUCN (n = 40) or AICN (n = 42) after surgery. No significant differences in characteristics were observed between these groups, excluding the more frequent receipt of chemotherapy by patients in the AUCN group ($P = 0.048$), as presented in Table 1.

Table 1. Baseline patient characteristics.

Characteristic	AUCN	AICN	P
Number (%)	40 (48.8)	42 (51.2)	>0.05
Age, years	44.2 ± 6.5	45.8 ± 7.6	>0.05
BMI, kg/m^2	23.2 ± 7.8	21.6 ± 8.4	>0.05
Anxiety S-AI, mean (SD)	7.5 ± 3.4	8.2 ± 3.6	>0.05
Depression BDI, mean (SD)	32.6 ± 6.6	34.91 ± 7.20	>0.05
Dysphoria, N (%)	32 (80)	36 (85.7)	>0.05
Disease stage	I	I	
Tumor type	HER2+	HER2+	
Tumor location			
Left breast, N (%)	18 (45.0)	20 (47.6)	>0.05
Right breast, N (%)	22 (55.0)	22 (52.4)	>0.05
Surgical method, N (%)			
Conservative surgery	15 (37.5)	16 (38.1)	>0.05
Modified mastectomy	14 (35.0)	16 (38.1)	>0.05
Mastectomy + SLNB	11 (27.5)	10 (23.8)	>0.05
Therapy, N (%)			
Hormonal therapy	20 (50.0)	22 (52.4)	>0.05
Chemotherapy	12 (30.0)	10 (23.8)	0.048
Radiotherapy	8 (20.0)	10 (23.8)	>0.05

AUCN, anesthesia with usual care nursing; AICN, anesthesia with intensive care nursing; BMI, body mass index; S-AI, State-Trait Anxiety Inventory; BDI, Beck Depression Inventory; SLNB, sentinel lymph node biopsy.

The results illustrated that AICN shortened the time to awakening (42.5 min vs. 57.5 min, $P = 0.036$) and improved the time to orientation (45.5 min vs. 62.6 min, $P = 0.025$) after anesthesia compared with the findings for AUCN. AICN additionally decreased the rates of incision infection ($P = 0.012$), drug extravasation ($P < 0.001$), and catheter exposure ($P < 0.001$). Patients in the AICN group exhibited lower rates of nausea (7.1% vs. 20%, $P < 0.001$), dysphoria (9.5% vs. 17.5%, $P < 0.001$), anxiety (3.0% vs. 5.2%, $P = 0.032$), depression (12.4% vs. 20.4%, $P = 0.025$) and vomiting (4.8% vs. 12.5%, $P = 0.020$) than those in the AUCN group (Table 2).

This study evaluated the effects of AICN and AUCN on complications in patients with breast cancer after surgery. Compared with the findings for AUCN, AICN was associated with lower pain (2.75 vs. 4.0, $P = 0.034$, Figure 1) and inflammation scores (3.75 vs. 5.75, $P = 0.013$, Figure 2). Meanwhile, AICN shortened postoperative hospital stay (9.0 vs. 7.0, $P = 0.045$, Figure 3) and improved survival versus AUCN (81% vs. 70%, $P = 0.022$, Figure 4).

Finally, the health-related quality of life of patients with breast cancer was evaluated between the AUCN and AICN groups. The global quality of life (58.5 vs. 50.2, $P = 0.036$), physical functioning (75.8 vs. 60.1, $P = 0.013$), emotional functioning (70.4 vs. 52.4, $P = 0.006$), and social functioning scores (64.8 vs. 52.7, $P = 0.026$) were improved by AICN. AICN was linked to lower severity of insomnia (32.8 vs. 42.5, $P = 0.035$) and higher patient satisfaction (8.5 vs. 6.5, $P = 0.042$) than AUCN (Table 3).

Table 2. Efficacy of AICN in patients with breast cancer after surgery.

Characteristic	AUCN	AICN	P
Time to awakening (minutes)	57.5 ± 10.8	42.5 ± 8.6	0.036
Time to orientation (minutes)	62.6 ± 14.3	45.5 ± 12.5	0.025
Incision infection, N (%)	7 (17.5)	4 (9.5)	0.012
Drug extravasation, N (%)	10 (25.0)	6 (14.3)	<0.01
Catheter exposure, N (%)	7 (17.5)	2 (4.8)	<0.01
Nausea, N (%)	8 (20.0)	3 (7.1)	<0.01
Dysphoria, N (%)	7 (17.5)	4 (9.5)	0.013
Vomiting, N (%)	5 (12.5)	2 (4.8)	0.020
Anxiety S-AI, mean (SD)	5.2 ± 1.6	3.0 ± 1.8	0.032
Depression BDI, mean (SD)	20.4 ± 5.2	12.4 ± 4.7	0.025

AUCN, anesthesia with usual care nursing; AICN, anesthesia with intensive care nursing; S-AI, State-Trait Anxiety Inventory; BDI, Beck Depression Inventory.
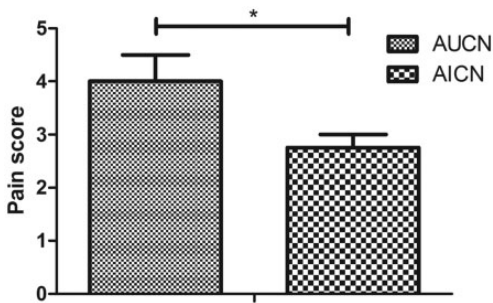

Figure 1. Pain scores in the anesthesia with intensive care nursing (AICN) and anesthesia with usual care nursing (AUCN) groups. *$P < 0.05$ vs. AUCN.
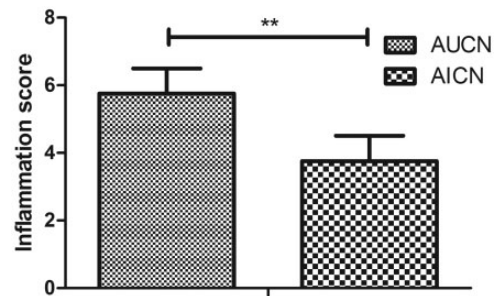

Figure 2. Inflammation scores in the anesthesia with intensive care nursing (AICN) and anesthesia with usual care nursing (AUCN) groups. *$P < 0.05$ vs. AUCN.

Discussion

Breast reconstructive surgery can improve patients' emotional relationships and social functioning after mastectomy, and postoperative intensive care nursing targeting these variables results in rapid responses during hospital stay.[22] Previously reported findings suggested that timely AICN is important for the health-related quality of life for patients with breast cancer after surgery.[23] In this study, we investigated the effects of AICN on complications among patients with breast cancer after surgery.
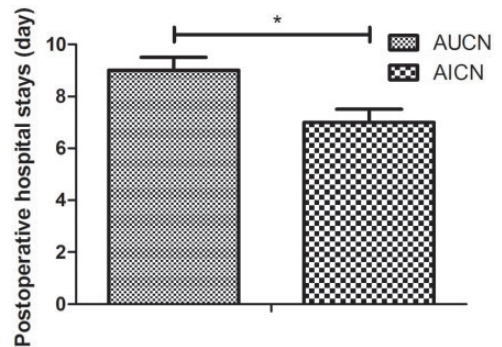

Figure 3. Postoperative hospital stay in the anesthesia with intensive care nursing (AICN) and anesthesia with usual care nursing (AUCN) groups. *$P < 0.05$ vs. AUCN.
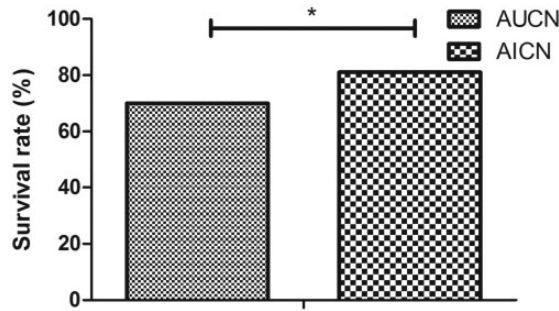
Figure 4. Survival in the anesthesia with intensive care nursing (AICN) and anesthesia with usual care nursing (AUCN) groups. *$P < 0.05$ vs. AUCN.

Table 3. Health-related quality of life questionnaire scales between AUCN and AICN group for postoperative breast cancer patients.

Scales of the quality of life questionnaire	AUCN	AICN	P
Global quality of life	50.2 ± 14.5	58.5 ± 10.4	0.036
Functional scale			
Physical functioning	60.1 ± 16.6	75.8 ± 14.8	0.013
Role functioning	62.5 ± 12.2	64.8 ± 13.5	0.37
Emotional functioning	52.4 ± 8.6	70.4 ± 10.7	0.006
Cognitive functioning	56.8 ± 10.5	67.6 ± 12.8	0.37
Social functioning	52.7 ± 11.5	64.8 ± 13.5	0.026
Insomnia	42.5 ± 10.8	32.8 ± 12.7	0.035
Patient satisfaction	6.5 ± 2.0	8.5 ± 1.5	0.042

AUCN, anesthesia with usual care nursing; AICN, anesthesia with intensive care nursing.

The current study revealed that AICN improved complication rates during hospitalization and after discharge compared with the effects of AUCN in patients with breast cancer after surgery.

Currently, nursing is highly specialized, and continuous efforts are required to promote competency in the nursing profession to meet elevated expectations related to cost-effectiveness, high-quality nursing services, and the societal demands placed on nurses.[24] The use of the Roy Adaptation Model helps nurses focus on the role of clinical nursing and its applications in patients undergoing breast-conserving surgery.[11] In breast cancer surgery, the type of anesthesia influences the risks of oxidative stress and inflammation, changes in the levels of molecular regulators, and disease outcomes, and regional anesthesia was revealed to be beneficial for decreasing and attenuating tumor recurrence and inflammation in patients with breast cancer.[25]

The mean postoperative hospital stay for patients undergoing breast surgery is approximately 10 days. Our results illustrated that the mean postoperative hospital stays for patients undergoing breast surgery were 9 and 7 days in the AUCN and AICN groups, respectively. Based on specific knowledge regarding anesthesia nursing,

we analyzed complications between these groups. As expected, patients in the AICN group displayed lower risks of incision infection, drug extravasation, and catheter exposure than those in the AUCN group. Notably, lower rates of nausea, dysphoria, anxiety, depression, and vomiting were observed in the AICN group. However, this study did not perform a sample size calculation, and thus, the limited number of patients may have affected the statistical significance of our results. Therefore, we plan to conduct additional research using larger populations and a sample size calculation.

Postoperative complications after breast cancer surgery have received substantial attention given their associations with survival.[26] The study results demonstrated that patients in the AICN group had lower pain and inflammation scores than those in the AUCN group. In addition, AICN shortened hospital stay and the time to awakening and improved the time to orientation in postoperative patients with breast cancer. An unanticipated finding was that survival rate was higher in the AICN group than in the AUCN group. This study also uncovered that AICN increased global quality of life, emotional functioning, cognitive functioning, and social functioning scores and reduced the severity of insomnia and the financial burden compared with the effects of AUCN. It is expected that AICN results in a larger decrease of APRs because mastectomy is a more invasive surgery than lumpectomy.

In conclusion, this controlled trial in patients undergoing surgery for breast cancer illustrated that AICN can significantly reduce the risk of complications compared with the outcomes of AUCN. The use of AICN resulted in significantly improved patient satisfaction; reduced rates of nausea, dysphoria, anxiety, and depression; and increased survival. The current data suggest that AICN can result in improved outcomes for patients with breast cancer after surgery.

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References

1. Bener A, Alsulaiman R, Doodson L, et al. An assessment of reliability and validity of the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30 among breast cancer patients in Qatar. *J Family Med Prim Care* 2017; 6: 824–831.
2. Zhang YF, Kang HB, Li BL, et al. Positive effects of soy isoflavone food on survival of breast cancer patients in China. *Asian Pac J Cancer Prev* 2012; 13: 479–482.
3. Lv M, Li B, Li Y, et al. Predictive role of molecular subtypes in response to neoadjuvant chemotherapy in breast cancer patients in Northeast China. *Asian Pac J Cancer Prev* 2011; 12: 2411–2417.
4. He ZY, Tong Q, Wu SG, et al. A comparison of quality of life of early breast cancer patients treated with accelerated partial breast irradiation versus whole breast irradiation in China. *Breast Cancer Res Treat* 2012; 133: 545–552.
5. Davari M, Amani B, Mokarian F, et al. Effectiveness of trastuzumab as adjuvant therapy in patients with early stage breast cancer: a systematic review and meta-analysis. *Med J Islam Repub Iran* 2017; 31: 88.
6. Zhang L, Jiang M, Zhou Y, et al. Survey on breast cancer patients in China toward breast-conserving surgery. *Psychooncology* 2012; 21: 488–495.

7. Ruvalcaba-Limon E, Robles-Vidal C, Poitevin-Chacon A, et al. Complications after breast cancer surgery in patients treated with concomitant preoperative chemoradiation: a case-control analysis. *Breast Cancer Res Treat* 2006; 95: 147–152.

8. Sinner B. [Oncology in anesthesia and operative intensive care medicine]. *Anaesthesist* 2018; 67: 79–80.

9. Pruss H. [Key qualification in anesthesia and intensive care nursing]. *Pflege Z* 2001; 54: 34–36.

10. Bartholomeyczik S, Schnell M and Aebi S. [Effectiveness of specialized nursing for patients with breast cancer and other gynecologic cancers: a prospective, longitudinal, two-arm pilot study in Switzerland]. *Pflege* 2008; 21: 353–354.

11. Ursavas FE, Karayurt O and Iseri O. Nursing Approach Based on Roy Adaptation Model in a Patient Undergoing Breast Conserving Surgery for Breast Cancer. *J Breast Health* 2014; 10: 134–140.

12. Lin JR and Lin ML. [Nursing experience with a schizophrenic breast cancer patient after mastectomy]. *Hu Li Za Zhi* 2014; 61: 97–103.

13. Klafke N, Mahler C, Von Hagens C, et al. A complex nursing intervention of complementary and alternative medicine (CAM) to increase quality of life in patients with breast and gynecologic cancer undergoing chemotherapy: study protocol for a partially randomized patient preference trial. *Trials* 2015; 16: 51.

14. Malley AM and Young GJ. A qualitative study of patient and provider experiences during preoperative care transitions. *J Clin Nurs* 2017; 26: 2016–2024.

15. Nakajima N, Oguchi M, Kumai Y, et al. Clinical outcomes and prognostic factors in patients with stage II-III breast cancer treated with neoadjuvant chemotherapy followed by surgery and postmastectomy radiation therapy in the modern treatment era. *Adv Radiat Oncol* 2018; 3: 271–279.

16. Thomas R, Rowell R, Crichton S, et al. Patients electing to have PET rather than surgery for operable breast cancer are a high risk of treatment failure. *Breast Cancer Res Treat* 2018; 172: 597–601.

17. Wang J, Wang S, Tang Y, et al. Comparison of Treatment Outcomes With Breast-conserving Surgery Plus Radiotherapy Versus Mastectomy for Patients With Stage I Breast Cancer: a Propensity Score-matched Analysis. *Clin Breast Cancer* 2018; 18: e975–e984.

18. Digesu C, Deodato F, Macchia G, et al. Hypofractionated radiotherapy after conservative surgery may increase low-intermediate grade late fibrosis in breast cancer patients. *Breast Cancer (Dove Med Press)* 2018; 10: 143–151.

19. Grass F, Cachemaille M, Martin D, et al. Pain perception after colorectal surgery: a propensity score matched prospective cohort study. *Biosci Trends* 2018; 12: 47–53.

20. Liu C, Li L, Lu WS, et al. A novel combined systemic inflammation-based score can predict survival of intermediate-to-advanced hepatocellular carcinoma patients undergoing transarterial chemoembolization. *BMC Cancer* 2018; 18: 216.

21. Li L, Mo FK, Chan SL, et al. Prognostic values of EORTC QLQ-C30 and QLQ-HCC18 index-scores in patients with hepatocellular carcinoma - clinical application of health-related quality-of-life data. *BMC Cancer* 2017; 17: 8.

22. Maly RC, Liu Y, Kwong E, et al. Breast reconstructive surgery in medically underserved women with breast cancer: the role of patient-physician communication. *Cancer* 2009; 115: 4819–4827.

23. Noh DY, Nam SJ, Ahn SH, et al. Association of clinical experiences with patient-reported outcomes among breast cancer surgery patients: breast cancer quality care study. *Qual Life Res* 2008; 17: 215–225.

24. Ros Nebot B. [Nursing basics in anesthesia: material to carry out regional anesthesia technics]. *Rev Enferm* 2010; 33: 8–12, 15–19.

25. Lukoseviciene V, Tikuisis R, Dulskas A, et al. Surgery for triple-negative breast

cancer- does the type of anaesthesia have an influence on oxidative stress, inflammation, molecular regulators, and outcomes of disease? *J BUON* 2018; 23: 290–295.

26. Rocco N, Rispoli C, Pagano G, et al. Breast cancer surgery in elderly patients: postoperative complications and survival. *BMC Surg* 2013; 13: S25.